

Conservation Status of *Rorippa calycina* (persistent-sepal yellowcress) in Montana

Prepared for:

U.S. Fish and Wildlife Service
Under SE-5P Segment 11

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This document should be cited as follows:

Heidel, B. 2001. Conservation status of *Rorippa calycina* (persistent-sepal yellowcress) in Montana. Report to the U.S. Fish and Wildlife Service. Montana Natural Heritage Program, Helena. 10 pp.

EXECUTIVE SUMMARY

Rorippa calycina (persistent-sepal yellowcress) is a regional Great Plains endemic that has been recorded at 23 sites in Wyoming, and a total of 5 historic or extirpated sites in Montana and North Dakota. It was a former candidate for listing under the Endangered Species Act until the candidate program was discontinued in 1996.

During this study, over 150 miles of riparian habitat and 6 reservoirs were surveyed in the areas of the known records, representing the historic range of *Rorippa calycina* in Montana. These surveys did not relocate the species. One of the 5 Montana collection records was found to be based on a misidentified specimen. The state

rank of *Rorippa calycina* in Montana remains at S1 with the expectation that Wyoming's Yellowtail Reservoir population may extend into the state.

This species' long-term viability hinges on existing Wyoming populations, most of which are associated with the artificial conditions of reservoirs rather than free-flowing rivers. These are considered relatively secure barring detrimental water management changes and noxious weed encroachment. This report and the most current Wyoming status report (Fertig and Welp 1998) are to be used together as references on the species status in Montana and pertinent aspects of its biology.

ACKNOWLEDGEMENTS

We thank Cathie Jean, Jack Greenlee, Susan Rinehart, and Mike Erwin for their paddling and help on the surveys. Cedron Jones graciously provided use of his canoe. Ronald Hartman (RM) reviewed and annotated the Choteau County voucher specimen. Special thanks are extended to Walter Fertig, Wyoming Natural Diversity Database, for a copy of the Wyoming status report on *Rorippa calycina*, for providing most of the current information and discussion on *Rorippa*

calycina in a joint Bighorn Canyon National Recreation Area rare plant report, and for interesting discussions on the species. The report was reviewed, edited and produced with the help of Joy Lewis, Sue Crispin, and Katrina Scheuerman. This work was supported by a Section 6 grant agreement between the U.S. Fish and Wildlife Service and the Montana State Library – Montana Natural Heritage Program.

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I. INTRODUCTION

Rorippa calycina (persistent-sepal yellowcress) was first discovered by F. V. Hayden in 1854 along the Yellowstone River upstream from Miles City near the historic site of Fort Sarpy (Sheffield), Montana. Two more collections were made before the turn of the century on or near the Missouri and Yellowstone Rivers in Montana, and one was made immediately downstream in North Dakota. The fact that *Rorippa calycina* was only known from four historic collections provided the basis for recommending that the species be considered for listing as threatened under the Endangered Species Act (Ayensu and DeFilipps 1978).

In Wyoming, *Rorippa calycina* was first discovered in 1977, and concerted surveys documented a total of 23 occurrences. Most of these are restricted to reservoir margins, and Wyoming botanists consider it secure in the state, based on the presumption that it can persist in reservoir settings. (Lichvar 1981, Fertig and Welp 1998). It was also collected in the Northwest Territories (Mulligan and Porsild 1966), 2500 km from its nearest known station, presumably dispersed by waterfowl (Rollins 1993).

There has been no statewide survey for the species in Montana or North Dakota, but two new Montana collection records were added by botanists doing consulting work in 1980 and 1990. One of the collection sites is a stock pond. This site was resurveyed and the species is considered extirpated (Heidel 1994). The other new record was based on a specimen that was misidentified, as determined in the course of this study.

Survey of this species was identified as a priority in Montana because it was known only from historic or extirpated records collected from areas that remain some of the most extensive free-flowing river habitat in the species' range. In 1999, the U.S. Fish and Wildlife Service provided Section 6 support to the Montana Natural Heri-

tage Program (MTNHP) to systematically survey for the species in Montana and evaluate its status. This report and the most current Wyoming status report (Fertig and Welp 1998) are to be used together as references on the species status in Montana and pertinent species biology.

This study was conducted by the Montana Natural Heritage Program (MTNHP), which collects, maintains and provides statewide information on features of biological significance, including species of special concern and natural vegetation. MTNHP serves as a clearinghouse, assembling information from secondary sources such as museum specimens, published articles, and reports and supplementing it with field studies.

II. METHODS

The author conducted field surveys in 1999-2000 to relocate the species in the four river reaches where it has been collected. The fifth collection was from a stock pond and was resurveyed in 1993 (Heidel 1994) and is considered extirpated. In addition to resurveyed areas, 3 other Missouri/Yellowstone River reaches and 6 reservoirs with potential habitat were surveyed. This included the lower Yellowstone River, immediately upstream from the single historic collection site in North Dakota.

We used information on the known distribution of *Rorippa calycina* in Montana, which had previously been compiled from herbarium records by MTNHP in the 1980's and integrated in MTNHP statewide data resources and references (e.g., Lesica and Shelly 1991). The following herbaria house the 5 specimens of *Rorippa calycina* from Montana: Montana State University, University of Montana, and Missouri Botanical Garden. Information on the habitat and status elsewhere was obtained from scientific literature and knowledgeable individuals.

In preparation for survey, sandy shoreline sites were identified and mapped with the help of

BLM land status maps (1:100,000), along with aerial photos in select cases. Fieldwork was conducted between 7 July – 22 Oct. The presence of other species of *Rorippa* in fruit indicated suitable phenology for identification of the rare species. The species flowers from late May to August, although blooming may extend into October under favorable circumstances. Since phenology and shoreline access depends on water levels, and fruits are needed for verification, most of our survey was conducted after river flows had peaked. At each site, notes were taken on the dominant species, the Mustard Family species present, and the substrate texture at the water's edge.

Other state species of special concern were documented on Plant Species of Special Concern survey forms, mapped, and photographed.

III. SPECIES INFORMATION

A. CLASSIFICATION

1. SCIENTIFIC NAME: *Rorippa calycina* (Engelm.) Rydb. (Rydberg 1900; Stuckey 1972).
2. SYNONYMS: *Nasturtium calycinum* Engelm. (Warren 1858)
3. COMMON NAMES: persistent-sepal yellowcress
4. FAMILY: Brassicaceae or Cruciferae (Mustard Family)
5. SIZE OF GENUS: Rollins (1993) recognizes approximately 75 species in this genus worldwide, with 29 species occurring in North America. Dorn (1984) recognizes eight species in Montana.
6. PHYLOGENETIC RELATIONSHIPS: *Rorippa calycina* is one of 6 species in Section *Sinuatae*, the most primitive group within the genus. Stuckey (1972) considered *Rorippa calycina* to be most closely related to *R. columbiae* (syn. *R. calycina* var. *columbiae*) and *R. subumbellata*, 2 other localized endemics of the Columbia River and Lake Tahoe areas, respectively. According to Stuckey, all 3 represent old, relic species and the only survivors of a formerly more widespread and morphologically variable complex. Among Montana species, *Rorippa calycina* is most closely related to *R. sinuata* (Stuckey 1972).

B. PRESENT LEGAL OR OTHER FORMAL STATUS

1. NATIONAL
 - a. LEGAL STATUS: *Rorippa calycina* was formerly a C2 candidate for listing under the Endangered Species Act (US Fish and Wildlife Service 1993). The C2 list included species that might have warranted listing as Threatened or Endangered, however, FWS lacked sufficient biological data to support a listing proposal. In February 1996, FWS revised its candidate policy and eliminated the C2 designation. As a result, *Rorippa calycina* currently has no legal status.
 - b. HERITAGE RANK: Definitions for global and state ranks are given in Table 1.
2. STATE
 - a. MONTANA
 - i. LEGAL STATUS: None.
 - ii. HERITAGE RANK: *Rorippa calycina* is ranked S1 in Montana, indicating that it is critically imperiled because of extreme rarity, based on one recent record that is considered extirpated, 3 historic records, and the strong likelihood of one Wyoming population crossing the state line.

c. NORTH DAKOTA

i. LEGAL STATUS: None.

- ii. HERITAGE RANK: *Rorippa calycina* is ranked SH in North Dakota, reflecting that this species is known only from one historic record in the state.

d. WYOMING

i. LEGAL STATUS: None

- ii. HERITAGE RANK: *Rorippa calycina* is ranked S3 in Wyoming, indicating that it is rare or local throughout its range or found locally in a restricted range in the state.

Table 1. HERITAGE PROGRAM RANK DEFINITIONS

Taxa are evaluated and ranked by the Heritage Program on the basis of their global (range-wide) status, and their state-wide status according to a standardized procedure used by all Natural Heritage Programs (The Nature Conservancy 1992). These ranks are used to determine protection and data collection priorities, and are revised, as new information becomes available.

For each level of distribution—global and state—species are assigned a numeric rank ranging from 1 (critically imperiled) to 5 (demonstrably secure). This reflects the species' relative endangerment and is based on the total number of occurrences, as conditioned by degree of habitat threat, geographic distribution patterns and population size and trends. General ranking standards are summarized below.

RANK/DEFINITION

- | | |
|---|---|
| 1 | Critically imperiled because of extreme rarity (usually 5 or fewer occurrences, or very few remaining individuals), or because of some factor of its biology making it especially vulnerable to extinction. |
| 2 | Imperiled because of rarity (usually 6 to 20 occurrences), or because of other factors demonstrably making it very vulnerable to extinction throughout its range. |
| 3 | Vulnerable because of rarity (usually 21 to 100 occurrences) or found in a restricted range even though it may be abundant at some of its locations. |
| 4 | Apparently secure, though it may be quite rare in parts of its range, especially at the periphery. |
| 5 | Demonstrably secure, though it may be quite rare in parts of its range, especially at the periphery. |
| U | Possibly in peril, but status uncertain, more information needed. |
| H | Historical, known only from records over 50 year ago, may be rediscovered. |
| X | Believed to be extinct; historical records only. |

C. DESCRIPTION

1. GENERAL NON-TECHNICAL DESCRIPTION: Persistent-sepal yellowcress is a rhizomatous short-lived perennial herb with upright or spreading stems 10-40 cm tall. The stems and foliage are pubescent throughout with stiff, unbranched hairs. Stem leaves are pinnately divided or wavy-lobed, sessile, and 2.5-5 cm long. The flowers are borne in terminal and axillary inflorescences and have 4 yellow petals 3-5 mm long and 4 sepals that persist in fruit. Fruits are ovoid to nearly globose, 2-4 mm long, and conspicuously pubescent with unbranched hairs that are broadest at the base. Styles in fruit are 1-2 mm long and glabrous (Stuckey 1972; Hitchcock et al. 1964; Dorn 1984; Rollins 1993; Fertig et al. 1994; Fertig and Welp 1998; Heidel and Fertig 2000).
2. SIMILAR SPECIES: *Rorippa sinuata* has elongate, glabrous fruits over 5 mm long, deciduous sepals, and round, glassy, ball-like hairs on the leaves. *R. curvipes* often has white petals, finely hairy sepals, deeply pinnate leaves and glabrous to sparsely hairy fruits and leaves. All other Montana and Wyoming species of *Rorippa* are taprooted annuals or biennials with longer, more erect stems and fruits that are either round or narrowly elongate (Fertig and Welp 1998).

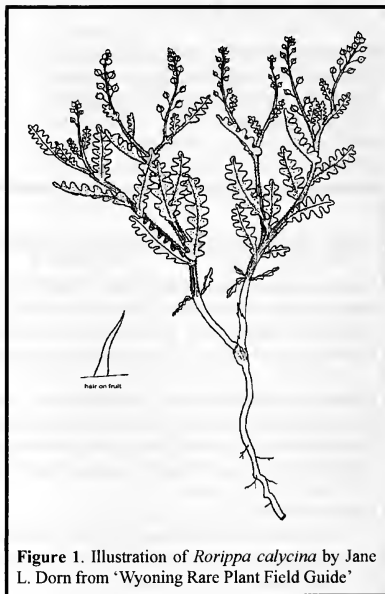


Figure 1. Illustration of *Rorippa calycina* by Jane L. Dorn from 'Wyoming Rare Plant Field Guide'

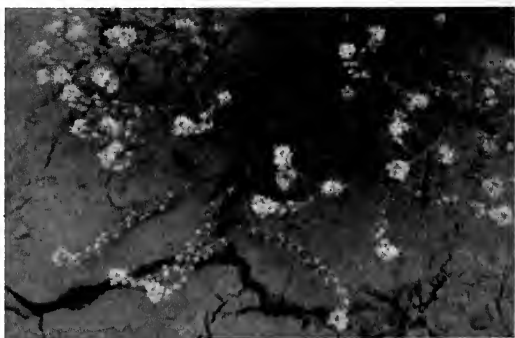


Figure 2. Photo of *Rorippa calycina* by Jennifer Whipple

D. GEOGRAPHICAL DISTRIBUTION

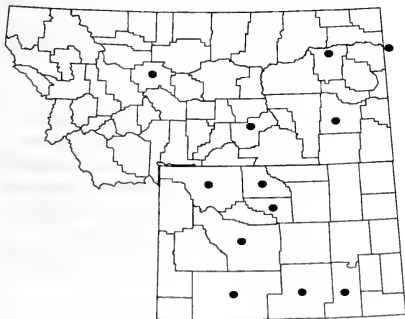
1. **RANGE:** *Rorippa calycina* is a regional endemic that has been documented in Montana, western North Dakota, and central Wyoming. Waterfowl carry its seeds, and one disjunct population was documented 2,500 miles to the north on the Arctic coast of Canada's Northwest Territories (Mulligan and Porsild 1966). In Montana, it was known from the Missouri and Yellowstone River drainages, including historic records from Cascade, Custer and Yellowstone counties, and a recent record from McCone County that is probably extirpated (Heidel 1994). We determined that a voucher specimen collected from Choteau County, Montana had been misidentified. The exceptional intactness of the Choteau County collection site and presence of other *Rorippa* species prompted examination of the voucher specimen. It was sent off for annotation by Ronald Hartman (RM) and redetermined to be *R. sinuata*. Thus, there are only 4 valid records for the species in the state, and we have the unusual circumstance of there being fewer species' records after survey than before. In Wyoming, *Rorippa calycina* is known from the Bighorn

Basin, North Platte River drainage, and Great Divide, Green River, and Wind River basins in Albany, Big Horn, Carbon, Fremont, Park, Sweetwater, and Washakie counties (Fertig and Welp 1998).

The 4 element occurrence records of *Rorippa calycina* in Montana are submitted with this report as separate attachments.

2. **EXTANT SITES:** There are no known extant populations in Montana.
3. **HISTORICAL AND EXTIRPATED POPULATIONS:** Three historic collections were made in Montana, including its first discovery.
1854 -Fort Sarpy (Sheffield) on the lower Yellowstone River (Custer Co., closest town: Miles City)
1880 -Between Sun River mouth (Great Falls) and Fort Benton, on "lakes"; this location may refer to the Missouri River but there are few oxbows, and it may also refer to coulees, the Shonkin Sag lake system, or Benton Lake. This unmappable record is in either Cascade or Choteau counties.
1890 -Custer Station, on or adjoining the lower Yellowstone River (Yellowstone County; closest town: Reedpoint). Note: This historic place name was located with the help of the Montana Historical Society. The county of distribution was previously held in question (Lesica and Shelly 1991).

Figure 3. *Rorippa calycina*-historic and extant distribution in Montana, North Dakota and Wyoming



The only collection of this species between 1900-2000 was made in McCone County in 1980 along the shores of a stock pond. At the McCone County site, the plant numbers were described as "few." It was resurveyed in 1994 and is considered extirpated (Heidel 1994). At the start of this study, we also recognized a Choteau County specimen collected in 1990. In the course of this study, the specimen was reviewed and ruled out as *Rorippa calycina*. It was annotated by Ronald Hartman, and determined to be *R. sinuata* (Hartman personal communication).

4. **PRESENT SITES WHERE STATUS REMAINS UNKNOWN:** There is some chance that the species may occur in Montana in the Bighorn Canyon, just north of the Yellowtail Reservoir, of Wyoming. However, as the reservoir flows northward, the topography changes from an open landscape to a constricted canyon and there is little potential shoreline habitat in Montana. The species has been documented in detail on the Yellowtail Reservoir (Heidel and Fertig 2000). Our limited Bighorn Canyon surveys in August of 1999 were conducted in exceptional highwater conditions and we were not able to prove or rule out that it extends into Montana.

5. **UNVERIFIED/UNDOCUMENTED REPORTS:** None

6. **AREAS SURVEYED BUT SPECIES NOT LOCATED:** A summary of field surveys is presented in Table 2, and cross-referenced in the report by the area name. Asterisked areas were surveyed as part of separate projects, but they included *Rorippa calycina* as a target.

Field surveys for this project encompassed the 4 river reaches of historic collections, select river reaches between historical collections, reservoirs visited in conjunction with other surveys, and reservoirs visited incidental to other travels. Not all potential habitat was surveyed. The potential habitat of the species, in river settings, includes all of the free-flowing Missouri River below the Dearborn River mouth, and all of the Yellowstone River below Greycliff to its mouth on the Missouri River. The surveys conducted for this project spanned approximated 20% of the species' potential riverine habitat in Montana.

7. **AREAS OF UNSURVEYED POTENTIAL HABITAT:** The most extensive areas of sandy riparian shoreline habitat were observed in the lowermost Yellowstone River between the towns of Intake and Savage. The lowermost

Yellowstone River may represent the most extensive unsurveyed potential habitat

Surveys at Deadman Basin and Martinsdale Reservoirs were too late for effectiveness. These sites had by far the most extensive sandy shoreline habitat among the reservoirs surveyed. In addition, the Bighorn Canyon may also have unsurveyed potential habitat.

The availability of sandy or gravelly shoreline habitat at Montana's largest reservoir, Fort Peck Reservoir, seems unlikely but has not been adequately evaluated.

E. HABITAT:

Rorippa calycina is an early-to mid-succession species found primarily along moist sandy to muddy banks of streams, stock ponds, and man-made reservoirs near the high-water line. The typical shoreline zone is a broad flat and includes sandy parent material. Early collections suggest that its natural habitat is confined to zones below the highwater mark of Great Plains rivers. Most populations are in sparsely-vegetated settings that are semi-disturbed and annually flooded, located in small inlets or bays with scattered clumps of foxtail barley (*Hordeum jubatum*), Sandberg's bluegrass (*Poa secunda*), western wheatgrass (*Pascopyrum smithii*) and a variety of native or exotic early successional forbs. Occasionally, plants can also be found on grassy shores or in openings amid coyote willow (*Salix exigua*) or salt cedar (*Tamarix chinensis*) thickets.

The most recent Wyoming status report (Fertig and Welp 1998) provides detailed information on habitat, including associated vegetation, frequently associated species, and soil relationships. In addition, that report provides the only available summary of population biology, demography and population ecology.

Table 2. *Rorippa calycina* survey areas in Montana

AREA	SURVEY TYPE	BASIS	SCOPE
Fort Sarpy (Sheffield) on Yellowstone River (Rosebud east to Horton)	9/14/99	1854 collection	App. 16 miles including shorelines and islands
7 miles s. of Custer Station (a railroad crossing) on Yellowstone River (Greycliff east to Columbus)	7/7/99 to 7/8/99	1890 collection	App. 31 miles including shorelines and islands
Between Sun River mouth and Fort Benton, on "lakes" – it is unclear whether the collection was made on or off the Missouri River	7/2/00	1880 collection	Kingsbury Lake WPA (east shore), Antelope Lake (drained)
White Cliffs area on Missouri River plus Loma bridge (Coal Banks east to Judith Landings)	7/7/00 to 7/9/00	1990 collection; incorrectly identified	App. 47 miles including shorelines and islands
McGuire Creek stock pond*	1993	1980 collection	Reservoir perimeters
Yellowstone River (Captain Clark FA east to Big Horn FA, plus Myers FA area)	9/13/99	Reports indicate sand deposits	App. 19 miles including shorelines and islands
Missouri River (Pelican Point FA east to Dunes FA)	9/4/00	Geological maps and reports indicate extensive sand deposits	App. 24 miles including shorelines and islands
Yellowstone River (Intake to Elk Island, plus Seven Sisters WMA)	9/30/00 to 10/1/00	Geological maps and reports indicate extensive sand deposits. This area is app. 50 miles upstream from the 1854 collection site of the species in ND.	App. 15 miles including shorelines and islands
Bighorn Canyon*	8/5/99 8/9/99	Occurs immediately upstream in WY above the canyon	Sandy inlets and gravel banks
Cooney Reservoir*	8/10/00	Incidental survey to sand shores	North side of reservoir on public land
Deadman Basin Reservoir	10/22/00	Incidental survey to sand shores	Brief visit at public access, after frost
Gartside Reservoir	10/1/00	Incidental survey to sand/gravel shores	Limited exposed shoreline – both sides
Kuester Reservoir	10/1/00	Incidental survey to sand shores	East side of reservoir on public land
Martinsdale Reservoir	10/22/00	Incidental survey to sand shores	Brief visit at public access, after frost

F. LAND OWNERSHIP:

The only recent record of this species in Montana was documented on private land, namely the McCone County collection from a stock pond setting where the species is considered extirpated. The precise locations of the three historic records are not known. The river valley landscapes in the vicinity of these areas are primarily privately owned, and public tracts are few.

IV. ASSESSMENT AND MANAGEMENT RECOMMENDATIONS

A. POTENTIAL THREATS TO CURRENTLY KNOWN POPULATIONS:

Changes in watershed management could have important impacts on reservoir populations of *Rorippa calycina* in Wyoming. Fluctuating water levels remain critical for creating and maintaining the shoreline flats habitat favored by this plant. Maintaining reservoirs at a constant level could encourage later successional species to become established and crowd out *Rorippa calycina*. Permanently raising water levels could wipe out existing, low-lying colonies, but should create new habitat higher on the bank. Colonization of such sites, however, could be restricted if existing seedbanks are eliminated (Fertig and Welp 1998).

Competition from exotic plants, especially salt cedar, is a serious threat at several reservoir sites in Wyoming, including Yellowtail Reservoir on Bighorn Canyon NRA. Dense growth of tamarisk can shade out *Rorippa* and stabilize its shoreline habitats (Fertig and Welp 1998). Spotted knapweed (*Centaurea maculosa*) is also present at the margins of this species' habitat, including a number of Bighorn Canyon NRA public access sites, though it is not nearly as widespread at this time as salt cedar. Leafy spurge (*Euphorbia esula*) is invading along the Yellowstone River. Weed control efforts, if employed, need to be

planned carefully to ensure that herbicides do not directly kill *Rorippa calycina* plants or negatively affect its pollinators.

Other potential threats include soil compaction from off-road vehicles in shoreline habitats, development of shoreline recreational facilities or access, trampling of plants and their habitat from high concentrations of livestock and wildlife, and impacts from pollution associated with mining (Fertig and Welp 1998).

Threats to *Rorippa calycina* parallel those of a close relative, *Rorippa columbiae*, which is listed as threatened. However, the latter is apparently restricted to free-flowing river habitat, where it is strongly affected by the water levels that are regulated by dams (Sauer and Leder 1985). Review of reports and publications on the species biology, ecology and management of *Rorippa columbiae* could yield valuable insights for *Rorippa calycina*.

B. MANAGEMENT PRACTICES AND RESPONSE:

Little evidence of grazing or browsing on leaves or stems of *Rorippa calycina* exists according to Wyoming investigators (Fertig and Welp 1998). They reported, however, that heavy shoreline trampling affects species' habitat suitability. Shoreline trampling is the most likely cause for extirpation at the McCone County occurrence in Montana (Heidel 1994).

C. CONSERVATION RECOMMENDATIONS:

See Fertig and Welp (1998)

D. STATUS RECOMMENDATIONS:

This species is thought to have expanded its habitat in Wyoming with the construction of new impoundments (Lichvar 1981, Fertig and Welp 1998, Rollins 1993). If reservoir occurrences are viable over the long term, then federal status is not warranted for *Rorippa calycina*. The apparent absence of this

species in its historic Montana range, including the free-flowing Yellowstone River, supports the case for monitoring of populations' status in Wyoming.

We recommend expansion of survey efforts for *Rorippa calycina* in Montana, with the highest priority in natural habitat on the lowest reaches of the Yellowstone River. Surveys on 3 reservoir settings are secondary priorities. The species is likely to extend from populations on the Yellowtail Reservoir, Wyoming into the Bighorn Canyon, Montana, even though there is limited potential habitat. We identified extensive potential habitat on Deadman Basin and Martinsdale Reservoir in late October, but it was too late for effective surveys. A dual-purpose survey for *Rorippa calycina* and salt cedar (*Tamarix chinensis*) is recommended at the latter 2 reservoirs. Precise locations of both species should be documented, for conservation of *Rorippa calycina* and eradication of *Tamarix chinensis*.

The lowest priority for survey is on the Charles M. Russell NWR. Fort Peck Reservoir is the largest reservoir in Montana, but it has limited sandy shoreline habitat. In general, *Rorippa calycina* should continue to be sought during river and reservoir management studies or studies of riparian vegetation and plants of concern.

E. INTERPRETATION OF SURVEY RESULTS TO DATE:

Though our surveys did not document extant populations of *Rorippa calycina* in Montana,

we did document the only recent record in the state of poison suckleya (*Suckleya suckleyana*), another plant species of concern, on the lower Yellowstone River. This species is associated with *Rorippa calycina* in Wyoming (Fertig and Welp 1998). We also documented a new addition to the state flora, square-stem monkeyflower (*Mimulus ringens*) on the Missouri River (Heidel and Vanderhorst in progress). In addition, we gathered valuable observations of watch species and early-succession riparian plant communities.

The reason(s) behind these negative results may lie with habitat loss or degradation, including altered hydrological regime, shore line trampling, weed invasion (salt cedar, leafy spurge, spotted knapweed), or their secondary effects of altering succession. The reason(s) may also be linked to fluctuating species numbers; the species' could be overlooked if numbers were low during the years of inventory, or during fall surveys, when it is in fruit and less conspicuous.

This study also suggests a dearth of botanical survey on the Missouri and Yellowstone rivers, given that we documented new records for several plant species of statewide significance. Additional survey for *Rorippa calycina* will certainly add to our knowledge of the plants and plant communities in these riparian systems.

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